Register Number:……..

KUMARAGURU
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B.E DEGREE EXAMINATIONS: NOV/DEC 2016

(Regulation 2014)

Fifth Semester

AERONAUTICAL ENGINEERING

U14AEE802**:** Experimental Stress Analysis

COURSE OUTCOMES

CO1: To understand the relation between the mechanics theory and experimental stress analysis.

CO2: To bring consciousness on experimental method of finding the response of the structure to different types of load.

CO3: To establish the fundamental concepts and newly experimental techniques.

CO4: To be able to use the experimental techniques on the practical problems.

CO5: To understand about various methods of Nondestructive testing.

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Match the given strain gauge given in List II with the type of strain gauge given in List II. CO3 [K_1]

List I	List II
A. Mechanical strain gauge	i. Vose and Sharpe
B. Optical strain gauge	ii. Rack and pinion
C. Interferometric strain gauge	iii. Capacitance
D. Electrical strain gauge	iv. Marten's mirror extensometer

	A	B	C	D
a)	i	ii	iii	iv
b)	iii	iv	i	ii
c)	ii	iv	i	iii
d)	iv	i	ii	iii

2. What is the main disadvantage of mechanical gauge? CO2 [K_2]

a) More Weight b) Very Sensitive

c) Absence of auxiliary equipments d) Less Accuracy

3. What is the other name of Inductance Strain Gauge? CO3 [K_1]

a) LVDT b) Magnetic Strain Gauge

c) Interferometer Strain Gauge d) Diffraction Strain Gauge

4. The resistance of a substance is inversely proportional to…… CO1 [K_2]

a) Cross Sectional area b) Resistivity

c) Length d) Applied Load

5. The computation method of strain Rosette data requires CO4 [K_2]

1. The accuracy
2. The speed of analysis
3. The Preference and aptitude of the individual
4. The amount of rosette analysis contemplated

The statements which are true is

a) 1 &2 b) 1,2&3

c) 1& 4 d) All of the above

6. What is the correct angle arrangement for four element rectangular rosette? CO3 [K_2]

a) 0,45,90,135 b) 0,30,60,90

c) 0,60,90,120 d) 0,40,80,120

7. Assertion (A): The Planes where principle stresses exist are likely to initiate the crack. CO5 [K_4]

Reason (R): Brittle coatings are used in the structures which produce maximum stress.

a) A is true but R is false b) A is false but R is true

c) Both A and R individually true and R is correct explanation of A d) Both A and R individually true and R is not correct explanation of A

8. Circular Polariscope consist of CO4 [K_1]

a) Two quarter wave plates b) One quarter wave plate

c) Two analyzer d) Two polarizer

9. Order the following components from the light source as in the plane polariscope. CO4 [K_1]

1. Analyzer
2. Project lens
3. Camera on screen
4. Model
5. Polarizer

a) 1-3-2-5-4 b) 5-4-1-2-3

c) 3-4-5-2-1 d) 4-1-2-5-3

10. Eddy current testing is used to detect — CO5 [K_2]

a) Surface roughness
b) Voids
c) Corrosion
d) All the above

PART B (10 x 2 = 20 Marks)

(Answer not more than 40 words)

11. Define: Sensitivity — CO1 [K_1]

12. For the following reading find the deformation sensitivity & strain sensitivity for Tuckerman optical gauge. Base length = 25 mm, d= 1/20, magnification factor = 5 — CO2 [K_3]

13. Give two examples for mechanically operated extensometers. — CO2 [K_1]

14. Classify Strain gauges based on the types of strain measurements. — CO3 [K_2]

15. What is gauge factor? — CO3 [K_1]

16. Draw the arrangement of wheatstone bridge and name its parts. — CO3 [K_1]

17. What is the difference between various forms of light? — CO4 [K_2]

18. State Stress optic law. — CO4 [K_1]

19. Define Holography. — CO5 [K_2]

20. State the advantages of Non Destructive Testing methods. — CO5 [K_2]

Answer any FIVE Questions:-

PART C (5 x 14 = 70 Marks)

(Answer not more than 300 words)

Q.No. 21 is Compulsory

21. Explain the principles of working of mechanical and electrical strain gauges. — CO3 [K_2]

22. (i)The strain readings as measured by a T-delta rosette at a point in a stressed aluminum body are given by : ε_a = 355 µm/m, ε_b = -276 µm/m, ε_c = 233 µm/m, and ε_d = -185 µm/m. Determine the principal stresses, maximum principal stress direction and maximum shear stress. (6) — CO3 [K_4]

(ii)Three strain gauges are applied to an area at a point in such manner that gauge 'c' makes positive angle of 75^0 with gauge 'a' and the gauge 'b' makes positive angle of 45^0 with gauge 'a'. the strain readings obtained from the gauges are as follows : calculate the principal stress, principal strains and principal direction and maximum shear strain. (8) CO3 [K_4]

Gauge	Strain (µm/m)
a	-800
b	-600
c	650

23. Give a detailed note on the operation of optical extensometer with its advantages and limitations. CO2 [K_2]

24. Describe the various types of Polariscope, stating its advantages and disadvantages CO4 [K_L]

25. Derive the equation of principle axis for Rectangular rosette and Delta rosette. CO2 [K_3]

26. Briefly explain the process of the following NDT techniques. CO5 [K_2]
    (i) Dye penetrant technique (7)
    (ii) Acoustic emission technique (7)

27. Write notes on : CO5 [K_2]
    (i) Brittle coating (7)
    (ii) Moire fringe technique. (7)

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